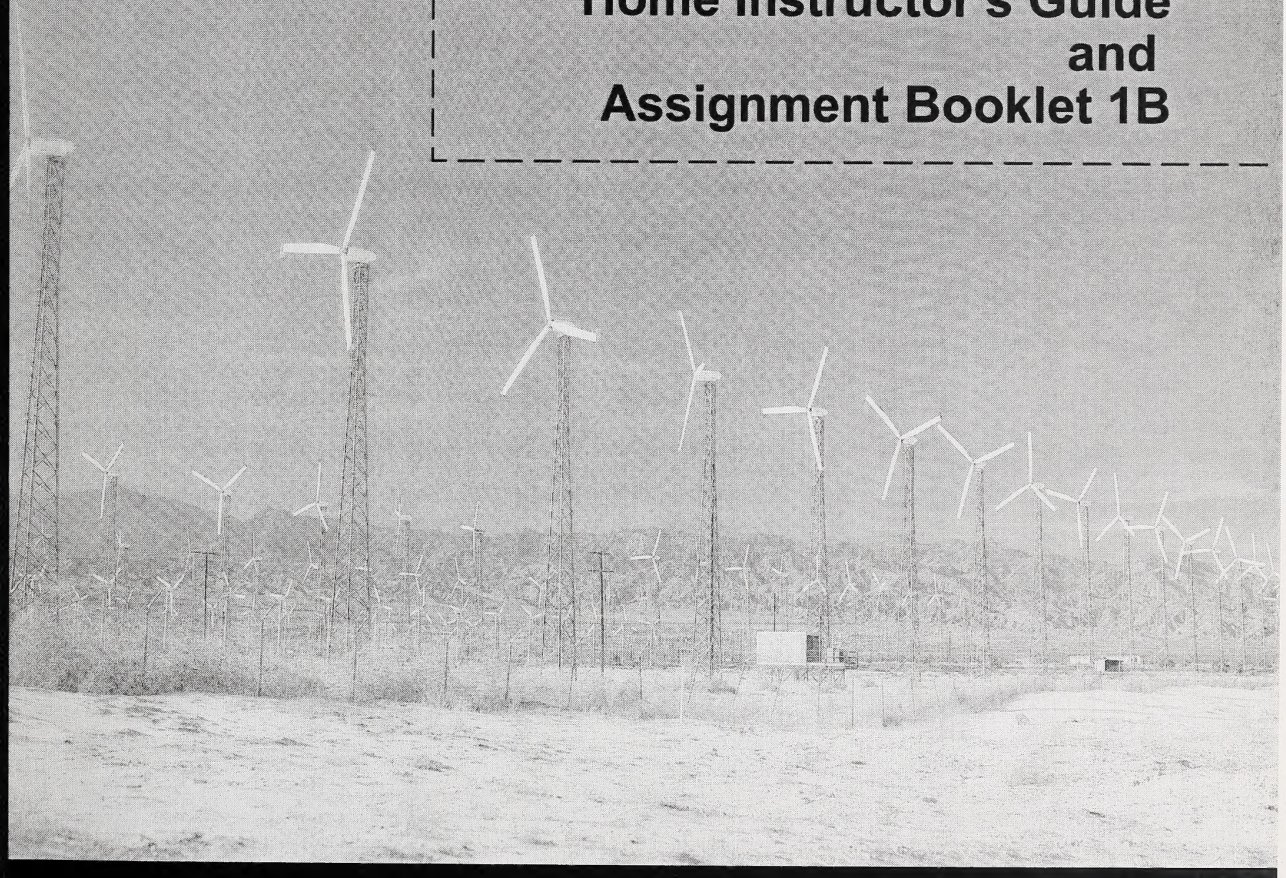
SCIENCE 7

Module 1 Interactions and Ecosystems

Home Instructor's Guide and Assignment Booklet 1B



Learning Technologies Branch

Alberta LEARNING

Science 7
Module 1: Interactions and Ecosystems
Home Instructor's Guide and Assignment Booklet 1B
Learning Technologies Branch
ISBN 0-7741-2415-6

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The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Home Instructor's Guide and Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	✓
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Learning, **http://www.learning.gov.ab.ca**
- Learning Technologies Branch, **http://www.learning.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.learning.gov.ab.ca**

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

Section 2: The Flow of Energy and Matter

In this section, the emphasis moves to the cycles that tie ecosystems together. Interconnections and interdependence of living and non-living things, the impacts of humans on natural ecosystems, the value of scientific knowledge and awareness, and environmentally friendly individual and group actions and choices are further developed in this section.

The following materials will be needed to complete this section.

Section 2: Lesson 1

- assorted equipment as determined by the student for Investigation 1-D

Section 2: Lesson 2

- snails, water plants, or seeds (e.g., bean, pea)
- 100 mL of bromthymol blue indicator
- an eyedropper
- assorted equipment as determined by the student for Investigation 1-G
- a large bowl
- plastic wrap

Note: The following warning is given in the Student Module Booklet.

Be careful. Bromthymol blue is a dye and can stain your hands and clothing. Make sure you do not suck any of the liquid into your mouth.

Suggested Answers

Section 2: Lesson 1

3. A *variable* is any factor that could change during the course of an investigation.

   A *manipulated variable (MV)* is a variable that is purposely adjusted in an investigation. You're expecting to see what effect the change will have on the responding variable.

   A *responding variable (RV)* is a variable in an experiment that is expected to change as a result of changes to the manipulated variable.

   A *controlled variable (CV)* is a variable that is not allowed to change (remains constant) throughout the course of an investigation.

   A *control*, in scientific terms, refers to a sample that is treated the same as the experimental samples in every way except for the variable that is manipulated. The control or control sample acts as a standard against which all experimental samples are compared.

4. a. The purpose of the experiment is to find the best food for plant growth.

   b. The manipulated variable is the type of plant food.

   c. The responding variable is the height of the plant. Note that height is a specific, quantitative measure of growth.

Section 2: Lesson 2

3. Answers will vary. Sample variables are given.

   manipulated variable (MV): Only 1 variable must be appropriate to the student's investigation.

   - the number of snails/plants
   - the length of time a snail/plant spends in a container of water
   - the number of seeds
   - the presence or absence of light

   responding variable (RV): the amount of carbon dioxide (as indicated by bromthymol blue)

   controlled variables (CV):

   - amount of indicator used
   - type of indicator used
   - type of seed used
   - length of time the seeds were pre-soaked
   - amount of time the seeds were allowed to germinate for
   - sealed container
   - background colour and amount of light used when judging indicator colour
   - number of seeds used in each sample
   - size and shape of container
   - wet paper towel on the bottom of each container
   - amount of water in paper towel

4. Answers will vary. A sample answer is given. **Note:** Make sure the procedure has a control (i.e., a jar with no plants or animals in it).

   Materials: (Optional)

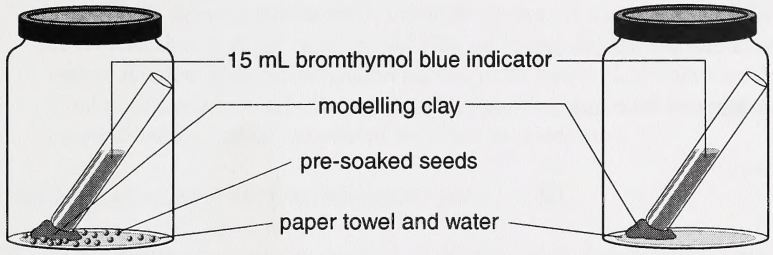
   - 150 pea seeds, pre-soaked for 24 hours
   - three 1-L jars with airtight lids
   - paper towel
   - 3 small test tubes
   - bromthymol blue solution
   - 15-mL measuring spoon (one tablespoon)
   - water

Note to home instructor: If you are using snails or water plants, you wouldn't need paper towels or test tubes. You will require an eyedropper, however.

Note: For more information and reliability, you could choose to have a second control sample. You could then pair a control with both the light and the dark sample. You would need to increase the materials accordingly.

For Germinating Seeds

Diagram: (Optional)



Light and Dark Samples **Control**

Procedure:

step 1: Label three identical, colourless, 1-L glass jars as "Light Sample," "Dark Sample," and "Control." The jars must have tight-fitting lids.

step 2: Place a folded sheet of paper towel into the bottom of each jar. Pour 30 mL (2 tablespoons) of water over each paper towel.

step 3: Very carefully measure 15 mL of bromthymol blue indicator and pour it into the small test tube. Place the test tube into a golf-ball sized lump of modelling clay. Flatten the bottom of the ball; then carefully slide the mounted tube to the bottom of a jar. Ensure the test tube is in a stable position and will not tip or spill.

step 4: Repeat step 3 two more times for the other two jars.

step 5: Use a spoon to carefully spread 50 pre-soaked pea seeds over the bottom of jars labelled "Light Sample" and "Dark Sample." Make sure you do not spill the indicator or drop any peas into the indicator.

step 6: Tightly seal each jar. Place one experimental sample in a warm, dark place and the other sample near a window. The control jar can be placed in any warm place where it will not be disturbed. Handle the jars carefully so their contents are not disturbed in any way.

step 7: Disturb the jars as little as possible. Check the colour of the indicator at about the same time each day for 5 days. Hold a sheet of clean, white paper behind each jar as you check the indicator colour. The amount of light hitting the samples should be very similar when you are judging the colours. Record the colours in your data table as blue, blue-green, green, green-yellow, or yellow.

For Aquatic Plants or Snails

Procedure

step 1: Label three identical, colourless, 1-L glass jars as "Light Sample," "Dark Sample," and "Control." The jars must have tight-fitting lids. (If using snails, only two jars will be needed.)

step 2: Add 500 mL of water to each of the glass jars.

step 3: Put the plants or snails into the sample jars.

step 4: Add 50 drops of bromthymol blue into the water in each jar.

step 5: Tightly seal each jar.

If using snails,

step 6: Place the jars in a warm place out of direct sunlight. Handle the jars carefully so they are not disturbed.

If using water plants,

step 6: Place one experimental sample in a warm, dark place and the other sample near a window. The control jar can be placed in any warm place where it will not be disturbed. Handle the jars carefully so they are not disturbed.

step 7: Check the colour of the indicator at about the same time each day for 5 days. Hold a sheet of clean, white paper behind each jar as you check the indicator colour. The amount of light hitting the samples should be very similar when you are judging the colours. Record the colours in your data table as blue, blue-green, green, green-yellow, or yellow.

5. Answers will vary. A sample table is given.

Carbon Dioxide Production by Germinating Seeds

Day	Indicator Colour		
	Control Sample	Light Sample	Dark Sample
0	blue	blue	blue
1	blue	blue-green	blue
2	blue	green	blue
3	blue	green-yellow	blue
4	blue	green-yellow	blue
5	blue	yellow	blue

6. a. **Textbook questions 2 and 3 of "Analyze," p. 50**

2. Students began the activity with enough knowledge to write an informed hypothesis. It is likely the observations supported the hypothesis. If the observations and the hypothesis did not agree, students should attempt to explain why. Perhaps their initial understanding of the use of bromthymol blue indicator, the respiration, or the process of photosynthesis were incomplete. They may need to examine their procedure for experimental errors or for significant, uncontrolled variables.

3. You cannot directly see the snails or plants giving off carbon dioxide, but you can infer it because of the colour change in the bromthymol blue indicator. Sealed containers rule out any other sources of carbon dioxide. If the investigation needed to be repeated, changes could be made in variables like the number of seeds or snails, the number of days the experiment was conducted, the size of the water plants or snails, and the amount of indicator or water used.

b. **Textbook question 4 of "Conclude and Apply," p. 50**

4. Water plants would use up much or all of the carbon dioxide produced by the snails. If so, the bromthymol blue would not change colour.

Section 2 Review

1. a. **Textbook question 1 of "Reviewing Key Terms," p. 55**

1. a. In an ecosystem, **producers** make their own food using the Sun's energy, and all other organisms are **consumers** because they cannot make their own food; they must acquire it.

b. **Predators** are animals that kill and eat other animals called **prey**.

c. Organisms that eat only producers are called **herbivores** and organisms that can eat anything are called **omnivores**.

d. Energy moves through the ecosystem, starting at the Sun and passing from organism to organism. This is called **energy flow**.

e. The two types of organisms that break down dead and waste material are called **scavengers** and **decomposers**.

f. A **food web** is a network of interconnected **food chains**.

g. To show how much energy is moving through a system, scientists use a **pyramid of numbers or pyramid of biomass**.

h. The two main naturally occurring cycles in the environment are the **carbon cycle** and the **water cycle**.

i. Pollutants enter a food chain and move from one organism to the next. The buildup of pollutants because of this movement is called **bioaccumulation**.

b. **Textbook questions 2 to 7 of "Understanding Key Concepts," p. 55**

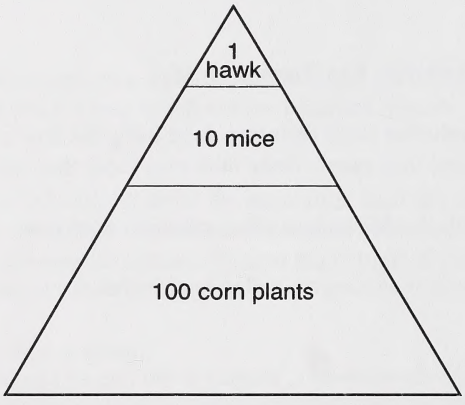
2. Hawks are carnivores; field mice are herbivores; and corn is a producer.

3. Niches in a community could include producers, consumers, decomposers, scavengers, herbivores, omnivores, carnivores, predators, prey, parasites, and hosts. Examples of each of these formal classifications are provided in the textbook.

4. Scavengers and decomposers are very important in an ecosystem because they complete the nutrient cycle by feeding on wastes and dead organisms. Decomposers are generally microscopic. (Mushrooms and earthworms are exceptions). Scavengers are larger animals that eat the wastes and dead organisms they find in their habitat.

5. A food web is a complex network formed from many interconnecting food chains.

6. The number of individual organisms that can be supported generally decreases with each step up a food chain. Very large or small organisms can change the normal number pattern. At each step in a food chain, energy and nutrients are used for daily activities or lost in wastes.



7. Answers will vary. Sample food chains are given.

micro-organism → shrimp → tuna → human

apple → human

2. Answers will vary. A sample answer is given.

Insects that rely on dandelions as an early source of food will die out, decrease in numbers, or be forced to switch to another food source. This will affect the organisms that eat or compete with these insects. Herbicides may bioaccumulate and negatively affect the health or reproductive success of organisms higher in the food chain (including humans). The herbicide may also kill other plant species it was not meant to kill. The presence of herbicides in the environment can also make people who are sensitive to these chemicals sick.

ASSIGNMENT BOOKLET 1B

Science 7
Module 1: Section 2 Assignment

Home Instructor's and Student's Comments:

STUDENT FILE NUMBER
(if label is missing or incorrect)

_____

Date Submitted:

_____

Apply Module Label Here

Name

Address

Postal Code

Please verify that preprinted label is for correct course and module.

FOR SCHOOL USE ONLY

Assigned Teacher:

_____

Date Assignment Received:

_____

Grading:

_____

Teacher's Comments

_____

Teacher's Signature

Home Instructor: Keep this sheet when it is returned to you as a record of the student's progress.

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When you register for distance learning courses, you are expected to send in Assignment Booklets for corrections regularly. Try to send each Assignment Booklet as soon as you have completed it. Before sending your Assignment Booklet, please check the following:

- Are all the assignments completed? If not, explain why.
- Has your work been reread to be sure the spelling and details are correct?
- Is the record form filled out and the correct module label attached?

MAILING

1. Postage Regulations

Do **not** enclose letters with Assignment Booklets.

Send all letters in a separate envelope.

2. Postage Rates

Take your Assignment Booklet to the post office and have it weighed. Attach enough postage and seal the envelope. Assignment Booklets will travel faster if correct postage is used and if they are in large envelopes that are no more than two centimetres thick.

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1. Assignment Booklets may be faxed. Contact your teacher for the fax number.

2. All faxing costs are the responsibility of the sender.

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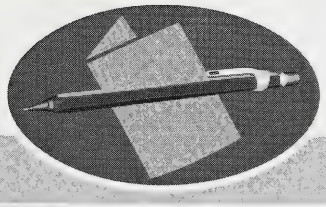
Assignment Booklets may be e-mailed. Contact your teacher for the e-mail address.

Science 7

Module 1

Interactions and Ecosystems

Assignment Booklet 1B



Learning Technologies Branch

Alberta LEARNING

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Section 2 Assignment	56	

Teacher's Comments

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Assignment Booklet 1B
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ASSIGNMENT BOOKLET 1B
SCIENCE 7: MODULE 1
SECTION 2 ASSIGNMENT

Your mark for this module will be determined in part by how well you do your assignments.

This Assignment Booklet is worth 56 marks out of the total 184 marks for the assignments in Module 1. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

56

Section 2 Assignment: The Flow of Energy and Matter

Read all parts of your assignment carefully and record your answers in the appropriate places.

(8)

1. Turn to page 38 of the textbook and look at the ecosystem diagram on the bottom of the page. You will see abiotic things, like air, soil, and sunlight. You also see biotic things, like micro-organisms, a hawk, and fish. Create a two-column table. In your table include five living and five non-living things. (Review pages 475 and 476 of the textbook if you're not sure exactly what should be in a table.)

(10)

2. There are many relationships between the following:

- niches
- herbivores
- prey
- producers
- carnivores
- omnivores
- consumers
- predators
- ecosystems

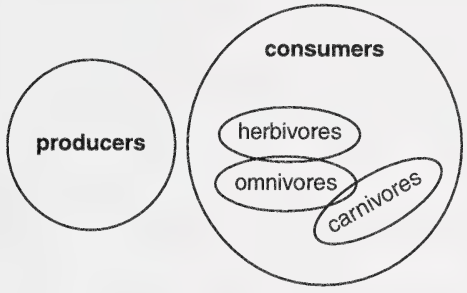
Plan a network tree concept map including these terms. Create it to show their relationships. Make sure it is complete and effectively shows how these terms relate to each other.
(**Note:** Review page 40 and pages 447 and 448 of the textbook.)

Return to page 40 of the Student Module Booklet and continue with Lesson 1.

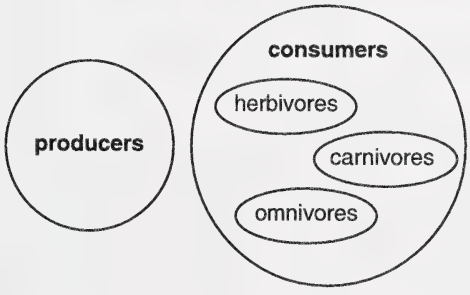
For questions 3, read the question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(2) _____ 3. Which Venn diagram shows the correct relationship between consumers, herbivores, carnivores, omnivores, and producers?

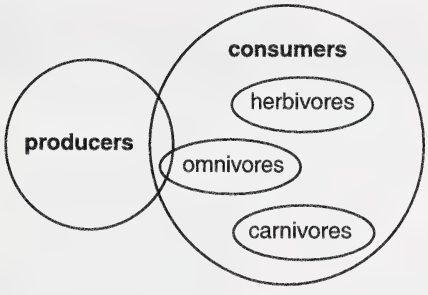
A.



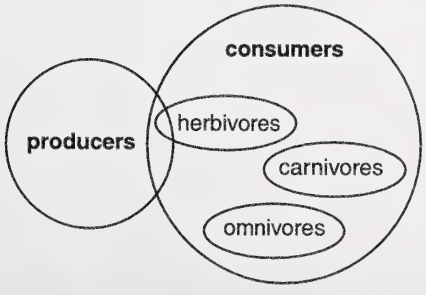
B.



C.



D.



(7)

4. The following organisms are found in an ecosystem:

- mice
- deer
- magpies
- insect-eating small birds
- seed-eating small birds
- elk
- herbaceous plants (such as grass and weeds)
- insects (such as mosquitoes and grasshoppers)
- bears
- wolves
- hawks
- spruce trees
- snakes
- aspen trees
- grasses

Draw a pyramid of biomass for a food chain of at least four organisms. Add your own quantitative data based on what you learned in this module. Write the term *decomposers* beside your pyramid. Use arrows to show how decomposers relate to each food level and their ecosystem.

Return to page 53 of the Student Module Booklet and begin Lesson 2.

(2) 5. Turn to page 50 of the textbook. Review "Investigation 1-G: Telltale Snails." Write your own scientifically testable question for it. (**Hint:** Choose your manipulated and responding variables. Insert them into the following question formula.)

How does the _____
(Insert your manipulated variable here.)

affect the _____?
(Insert your responding variable here.)

(4) 6. Write a hypothesis for "Investigation 1-G." Use the manipulated and responding variables you chose. Be sure you have added new, relevant information to the explanation.

If you _____
(increase, decrease, or change)

the _____,
(manipulated variable)

the _____
(responding variable)

will _____
(increase, decrease, remain the same, change, or any combination of these)

because _____
(reason for your prediction)

_____

Return to page 57 of the Student Module Booklet and continue with Lesson 2.

7. Imagine a moose population and a wolf population existing on a large island. One fall, hunters were invited to the island to hunt wolves. The wolf hunt was very successful from the hunters' perspective. As a result, most of the wolves were killed. Indicate what would likely happen over the next few years if the community was left untouched by humans. Be specific. Communicate clearly to show your understanding of the concepts in this section.

(3) a. Consider the first year or two. What will happen to the vegetation, moose, and wolf populations? Why?

(3) b. Consider the next few years. What will happen to the vegetation, moose, and wolf populations? Why?

(3) c. Consider the longer term. What will happen to the vegetation, moose, and wolf populations? Why?

_____

_____

_____

_____

_____

_____

_____

For question 8, read the question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(2) _____ 8. At one time, a mercury-based fungicide was applied to seeds. This kept seeds from being spoiled by fungi. (Remember, mercury is a stable non-excretable poison.) Mice often ate the treated grain. Which food chain is technically correct and **best** shows this situation?

A. **Bioaccumulation of Mercury**

Treated grain	→	**Mice**	→	**Hawks**
(1 unit)		(10 units)		(100 units)
producer		consumer		consumer

B. **Bioaccumulation of Mercury**

Treated grain	→	**Mice**	→	**Hawks**
producer		consumer		consumer
		omnivore		carnivore
		prey		predator

C. **Bioaccumulation of Mercury**

Treated grain	→	**Mice**	→	**Hawks**
(1 unit)		(10 units)		(100 units)
producer		consumer		consumer
		omnivore		carnivore
		prey		predator

D. **Bioaccumulation of Mercury**

Treated grain	→	**Mice**	→	**Hawks**
(1 unit)		consumer		consumer
producer		omnivore		carnivore
		prey		predator

9. Samantha decided to buy a pet fish for Luc's birthday. Samantha decided to follow the directions for a homemade fish tank she found in a magazine. The directions said that it was a complete ecosystem. It will only have to be cleaned about once a month. Samantha put 1 L of water and some aquarium gravel in a 2-L pop bottle. She let the water sit long enough for the chlorine to disappear. Finally, Samantha added a water plant, a snail, and a small fish.

   When Samantha gave Luc his gift, she also gave him some fish food. She told him that he should add a little to the tank each day.

(4) a. Briefly describe the roles (niches) of the plant and the snail in this tiny ecosystem.

_____

_____

_____

_____

(8) b. Complete this diagram to show how carbon might cycle through this ecosystem.

water plant ( )	**fish** ( )	**snail** ( )

Submit Assignment Booklet 1B to your teacher for assessment.
Then turn to page 66 of the Student Module Booklet and begin Section 3.

ASSIGNMENT BOOKLET DECLARATIONS

The Student's Declaration is to be signed by a student registered at the Alberta Distance Learning Centre. If the student is under 16, the Supervisor's Declaration is to be signed by the student's supervisor, who is usually a home instructor, teacher, or home-schooling coordinator. Failure to complete this page may invalidate the assignment results.

STUDENT'S DECLARATION

- I have followed the instructions outlined in the Student Module Booklet.
- I have completed the activities to prepare myself for the assignments in this Assignment Booklet.
- I completed the assignments in this Assignment Booklet by myself.

_____

Student's Signature

SUPERVISOR'S DECLARATION

I hereby certify that I have supervised the learning activities completed by _____.

Student's Name

I also certify that to the best of my knowledge the assignments in this Assignment Booklet were completed independently by this student.

_____

Supervisor's Signature

If you, the student or supervisor, have any comments or observations regarding this module, write them in the following space.

_____

_____

_____

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